This Amendment is submitted in response to the non-final Office Action of April 2, 2008. Claims 1-6, 8-19, 21-31, 33-44, 46-55, 57-65 and 67-71 are pending. Claims 1-2, 4, 14-15, 17, 25, 27, 29, 37, 39-40, 42, 50-51, 53, 61, 63 and 71 are amended and Claim 13 is canceled by this response. No new matter is submitted, and support for the above amendments can be found at least in paragraphs [0004], [0026]-[0058], [0066]-[0067], and [0070]-[0071].

I   Interview of June 12, 2008

Applicants thank Examiner Silver for granting an in-person interview on June 12, 2008 at 3:30 PM. Examiner Silver, Supervisor Shah and Applicants' representative, MacLane Key, were in attendance. The rejections under 35 U.S.C. §§101, 103 and 112 were discussed. Agreement was not reached. However, Applicant's thank Examiner Silver for his suggestion of filing a continuation-in-part as a possibility for addressing these rejections.

II   Claim Objection

The Office Action Objected to Claim 71 under 37 C.F.R. §1.75(c) as being of improper dependent form for failing to further limit the subject matter of a previous claim. Specifically, the Office Action states that the "observed data" constitutes non-functional descriptive material and the steps of the parent claim do not change their functions based upon the content of the input set. Applicants respectfully disagree. However, Claim 71, as amended, recites the step of populating the input set of data with only observed data. It is respectfully submitted that Claim 71 is not in improper dependent form under 37 C.F.R. §1.75(c), and that this objection should be withdrawn.

III   Rejections Under 35 U.S.C. 101

The Office Action rejected Claims 1-6, 8-19, 21-31, 33-34, 46-55, 57-65 and 67-71 under 35 U.S.C. 101 as being directed to non-statutory subject matter.

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Specifically, the Office Action states, "...the claimed invention lacks a real-world practical application." Further, the Office Action states, "Applicants are claiming a method of computing, which is merely a concept without a real world value." Applicants respectfully disagree.

Independent Claims 14 and 50 are directed to a computer program product; not to a method. Similarly, independent Claims 27 and 61 are directed to a system; not to a method. Further, independent Claim 1 recites outputting a probability density and determining a number of speakers from the probability density. It is respectfully submitted that both the step of outputting the probability density and of outputting the number of speakers from the probability density provide "real-world value." Similarly, the remaining independent claims recite outputting a probability density and outputting a number of clusters from the probability density, or similar language. It is further respectfully submitted that both outputting the probability density and outputting the number of clusters from the probability density provide "real-world value." For at least these reasons, it is respectfully submitted that these rejections should be withdrawn.

Further, in accordance with the *Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility* (OG Notices, 22 Nov. 2005) and MPEP 2106, the Examiner must first determine if the claimed invention falls within at least one of the four enumerated categories of patentable subject matter recited in § 101 (process, machine, manufacture of composition of matter). The Examiner must then determine if the claim falls within one of the § 101 judicial exceptions (abstract idea such as a mathematical algorithm, natural phenomenon, and law of nature).
For claims including a judicial exception, the claims must be for a "practical application" of the judicial exception. For a practical application, the claimed invention transforms an article or physical object to a different state or thing or the claimed invention produces a "useful, tangible, and concrete result."

While the Applicant does not admit that the pending claims fall within a judicial exception, in order to expedite prosecution, the Applicant will assume here that the claimed invention falls within a judicial exception and show that the claimed invention is for a practical application of a judicial exception because it produces a "useful, tangible, and concrete result."

Useful

To be useful, the claimed invention must meet the utility requirements of § 101. The utility requirement is met when the Applicant has asserted that the claimed invention is useful for any particular practical purpose (i.e., it has a "specific and substantial utility") and the assertion would be considered credible by a person of ordinary skill in the art (MPEP 2107).

A purpose for the Applicant's claimed invention is for outputting a probability density. This purpose has utility to one of ordinary skill in the art because it tells one of ordinary skill in the art how many clusters are present in a particular data set, which one of ordinary skill in the art can use, for example, to determine how many speakers are present. This information is useful to one of ordinary skill in the art for a wide variety of specific applications. Further, outputting how many clusters or speakers are present using the output probability density also has utility to one of ordinary skill in the art because accurate determination of clusters is desirable for optimal operation of many computer systems known to one of ordinary skill in the art. It is respectfully submitted that such a purpose is not "throw away", and is credible to one of ordinary skill in the art.

In one example (page 15, lines 17-20), speech data is modeled to determine the correct number of speakers in a room. In this example, the claimed invention may be utilized in sound source localization to determine where speech sounds are clustered in relation to a microphone or even for transcript generation. Various claimed

embodiments minimize the effects of outlier speech data which may otherwise be erroneously identified as a speaker while not under-representing the number of clusters present in the data. Thus, the presently claimed invention meets the useful result requirement.

Tangible

To be tangible, the process claim must set forth a practical application of that judicial exception to produce a real-world result. The Applicant thanks the Examiner for acknowledging that the claimed invention provides a tangible output (see, Final Office Action, June 15, 2007, page 3). Further, the claims recite outputting a number of speakers or clusters from the probability density or similar language. This produces a real-world result, that is, an output number of clusters or speakers.

As recited above, the Applicant's specification provides multiple examples of a useful, tangible, and concrete result (page 15, lines 17-24). In another example, image data is modeled. The claimed invention provides modeling of large homogenous regions of image data without being noticeably affected by small regions having different characteristics. These small regions are considered outliers as to the homogenous regions. In this example, the claimed invention provides the real-world application of correctly modeling the large homogenous region without introducing errors caused by the outlier data (i.e., the small regions of different characteristics). The Applicant submits that various claimed embodiments provide a real-world result of minimizing the affects of outliers on data modeling, as reflected by the number of clusters that is output. Thus, the presently claimed invention meets the tangible result requirement.

Concrete

To be concrete, the process must have a result that can be substantially repeatable or the process must substantially produce the same result again. The

opposite of "concrete" is unrepeatable or unpredictable. The Applicant submits that the claimed invention will produce the same result (i.e., same output probability density and number of clusters or speakers) each time the set of input data is introduced into a covered embodiment (assuming all other factors remain the same). Thus, the presently claimed invention meets the concrete result requirement.

Having shown that the claimed invention produces a useful, tangible and concrete result, the Applicant respectfully submits that the claimed invention is for a practical application of a judicial exception and thus satisfies § 101 requirements. Accordingly, the Applicant respectfully requests that the instant § 101 rejections be withdrawn.

IV   Rejections Under 35 U.S.C. §112, First Paragraph

The Office Action rejected Claims 1-6, 8-19, 21-31, 33-34, 46-55, 57-65 and 67-71 under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement. Specifically, the Office Action states that the Specification does not explain what makes an approximation "tractable." Applicants respectfully disagree and submit that because one of ordinary skill in the art would understand that an intractable problem is at least NP-hard to solve (see Abstract of U.S. Patent No. 7,184,993), one of ordinary skill in the art would also understand that a tractable approximation one that is not NP-hard to solve. The concepts of tractable and intractable problems are extremely well known to those of ordinary skill in the art. Further, it is respectfully submitted that one of ordinary skill in the art would have understood a tractable approximation is "performed" from the many examples provided in the specification. However, it is also respectfully submitted that the claims, as amended, do not recite the word "tractable." For at least the above reasons, it is respectfully submitted that the above rejections should be withdrawn.

V   Rejections Under 35 U.S.C. §112, Second Paragraph

The Office Action rejected Claims 1-6, 8-19, 21-31, 33-34, 46-55, 57-65 and 67-71 under 35 U.S.C. 112, second paragraph as being indefinite. Specifically, the Office Action states that the term "tractable" is relative and ambiguous and references a general public website for a definition. It is respectfully submitted that the terms "tractable" and "intractable" have a different, non-ambiguous meaning to ones of ordinary skill in the art as discussed above. However, also as discussed above, the claims, as amended, do not recite the word "tractable." For at least the above reasons, it is respectfully submitted that the above rejections should be withdrawn.

VI   Rejections Under 35 U.S.C. §103

The Office Action rejected Claims 1-6, 8-11, 14-19, 21-24, 27-31, 33-36, 39-44, 46-55, 57-65 and 67-71 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,704,018 ("Heckerman") in view of U.S. Patent Application Publication No. 20040098207 ("Friggens"). The Office Action rejected Claims 12-13, 25-26 and 37-28 under 35 U.S.C. §103(a) as being unpatentable over Heckerman in view of Friggens in further view of Official Notice. Applicants respectfully disagree.

Heckerman discloses a belief network generator. A belief network is generated utilizing expert knowledge retrieved from an expert in a given field and empirical data reflecting observations made in the given field.

Friggens discloses a system for observing and predicting physiological state of an animal. However, it is respectfully submitted that the combination of Heckerman and Friggens, even if proper, does not obviate computing an approximation being

performed by a processor calculating $q(\mathbf{s}) = \prod_{n,m}^{N,M} p_{nm}^{s_{nm}}$, $q(\pi) = D\left(\pi|\alpha\right)$,

$q(\boldsymbol{\mu}_m) = N\left(\boldsymbol{\mu}_m|m_m, \mathbf{R}_m\right)$, $q(\boldsymbol{\Lambda}_m) = W\left(\boldsymbol{\Lambda}_m|_m\mathbf{W}_m, \eta_m\right)$, or $q(u_{nm}) = G\left(u_{nm}|a_{nm}, b_{nm}\right)$. For at least the above reasons, it is respectfully submitted that Claim 1 and its dependent claims are patentably distinguished from Heckerman in view of Friggens and are in

condition for allowance. For similar reasons, it is respectfully submitted that Claims 39, 50 and 61 and their respective dependent claims are patentably distinguished over Heckerman in view of Friggens and are in condition for allowance.

Further, it is respectfully submitted that the combination of Heckerman and Friggens, even if proper, does not obviate a current estimate being computed using

$$p(\mathbf{s}|\pi) = \prod_{n,m}^{N,M} \pi_m^{S_{nm}} , \ p(\boldsymbol{\mu}_m) = N \ \left(\boldsymbol{\mu}_m | \mathbf{m}, \rho \mathbf{I}\right), \ p(\boldsymbol{\Lambda}_m) = W \ \left(\boldsymbol{\Lambda}_m | \mathbf{W}_0, \eta_0\right), \text{ or}$$

$p(\pi) = D\ \left(\pi|\boldsymbol{\alpha}\right)$. For at least the above reasons, it is respectfully submitted that Claim 14 and its dependent claims are patentably distinguished from Heckerman in view of Friggens and are in condition for allowance.

It is also respectfully submitted that the combination of Heckerman and Friggens, even if proper, does not obviate computing a lower bound of a log marginal likelihood as a function of current estimates of the posterior distributions of the modeling parameters using $L\ \left(q\right) \equiv \int q(\theta) \ln \left\{ \dfrac{p(\mathbf{X}, \theta)}{q(\theta)} \right\} d\theta \le \ln p(\mathbf{X})$. For at least the above reasons, it is respectfully submitted that Claim 27 and its dependent claims are patentably distinguished from Heckerman in view of Friggens and are in condition for allowance.

The Office Action took Official Notice with respect to the input data representing auditory speech data from an unknown number of speakers or image segmentation data from images. It is respectfully submitted that even if the Official Notice is properly taken, it does not correct for the deficiencies of Heckerman and Friggens discussed above. Further, it is respectfully submitted that it would not be obvious to combine the systems of Heckerman (a belief network generator) and Friggens (an animal physiological state predictor) with either auditory speech date or image segmentation data.

For at least the above reasons, it is respectfully submitted that Claims 12-13, 25-26 and 37-28 are patentably distinguished from Heckerman in view of Friggens in further view of the Official Notice taken and are in condition for allowance.

VII   M.P.E.P. §707.07(j)

M.P.E.P. §707.07(j) states:

"…If the examiner is satisfied after the search has been completed that patentable subject matter has been disclosed and the record indicates that the applicant intends to claim such subject matter, the examiner may note in the Office action that certain aspects or features of the patentable invention have not been claimed and that if properly claimed such claims may be given favorable consideration…"

Applicants respectfully request that the Examiner make Applicants aware of any subject matter disclosed by the present application which the Examiner believes is patentable. By doing so, the Examiner would help expedite prosecution by enabling Applicants to amend the present claims or draft new claims directed to such subject matter.

CONCLUSION

Accordingly, in view of the above amendment and remarks it is submitted that the claims are patentably distinct over the prior art and that all the rejections to the claims have been overcome. Reconsideration and reexamination of the above Application is requested. Based on the foregoing, Applicants respectfully requests that the pending claims be allowed, and that a timely Notice of Allowance be issued in this case. If the Examiner believes, after this amendment, that the application is not in condition for allowance, the Examiner is requested to call the Applicant's attorney at the telephone number listed below.

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Filing Date: November 28, 2003

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee that is not covered by an enclosed check please charge any deficiency to Deposit Account No. 50-0463.

Respectfully submitted,

Microsoft Corporation

Date: July 2, 2008   By: /MacLane C. Key/

MacLane C. Key, Reg. No.: 48,250
Attorney for Applicants
Direct telephone (703) 647-6566
Microsoft Corporation
One Microsoft Way
Redmond WA 98052-6399

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